

# choosing the proper casting design

**M**odern municipal and utility castings differ dramatically from traditional designs. Whereas previous designs required more material and more mass to achieve greater strength, current design methods and material quality control result in castings with higher strength, greater load capability, better performance, improved safety, and ergonomic benefits.

Gray iron remains the best material choice for municipal castings. Gray iron is highly resistant to corrosion, maintains compressive strength, abrasion resistance, vibration absorption, and low-notch sensitivity. It has an unequalled record of success as a material for construction and utility castings. Gray iron has a very long service life, and is extremely cost effective.

The American Association of State Highway and Transportation Officials (AASHTO) is a non-profit association with representation from highway and transportation departments of all fifty states, the District of Columbia, and Puerto Rico. AASHTO promotes the development, operation and maintenance of an integrated national transportation system. AASHTO specifications are recognized as prevailing standards throughout the United States.

Owners, designers and purchasers should require the foundry of manufacture to provide product certification. This certification should be issued by a licensed professional engineer stating that samples representing each heat have been tested and inspected in accordance with AASHTO M306, and exceeds the minimum load requirements specified.

When choosing a construction casting standard, it is imperative that the construction casting bear the load requirements of the installation. EJIW load rating designations provide some information about the relative strength of a casting design. If a designer has any doubt about the potential loading environment they should specify a stronger casting.



**Non-traffic:** Castings designated as non-traffic are intended for use in areas that are not subject to vehicle traffic. EJIW products designated as non-traffic include decorative items such as tree grates, or designs with raised surface areas such as “beehive” pipe and ditch grates. Generally nothing over 2,500 lbs. should be placed on these items. Duty rating is 0–2,500 lbs.

**Light duty:** Light duty castings are able to withstand some vehicular loading, but are not designed to accept roadway traffic. Items can accept loading from 2,500–16,000 lbs. These products may be subject to occasional traffic from process maintenance, mowers, etc. Meter boxes are an example of this type of product. Meter boxes are normally placed in grassy areas, but can withstand occasional traffic from mowers and service vehicles.



**Medium duty:** EJIW castings designated as medium duty accept loading from 16,000–40,000 lbs. These castings can accept standard traffic

loading, and are in conformance with H-20/HS-20 (wheel load of 16,000 lbs. on a tire contact area of 8” X 20”) or Federal Specification RR-F-621D (25,000 lbs. on a 9” X 9” load contact area). Castings with medium duty designation have been safely used in traffic areas for years, but lack the safety requirements of AASHTO M306.



**Heavy duty:** EJIW designed castings must meet the requirements of AASHTO M306 to be classified as heavy duty. AASHTO M306

requires that castings bear a minimum of 40,000 lbs. on a 9” X 9” area. This represents a 2.5 safety factor over the 16,000 lb. requirement of H20 and HS20. This load designation is appropriate for general traffic applications. Loading criteria is 40,000–100,000 lbs.



**Extra Heavy duty:** Casting is able to accept loading from 100,000–200,000 lbs. This meets the design loading associated with the FAA wheel loading.



**Extra Heavy duty Airport and Port Authority:** Casting is able to accept loading from 200,000 lbs. and up. This includes an additional safety factor over FAA design loading.

# Suggested specification

## for construction and utility castings

**GENERAL:** This specification is applicable for gray and ductile iron castings. All castings shall be manufactured in the United States of America. All manufacturers shall be approved suppliers and be able to demonstrate that there is an acceptable quality control program at the producing foundry, prior to supplying castings.

**MATERIALS:** Gray iron castings shall be manufactured from iron conforming to ASTM A48, Class 35B, as noted in AASHTO M306. Ductile iron castings shall conform to ASTM A536. The iron material used in products provided shall have a minimum recycled material content of 75%. The recycled materials shall consist of post-consumer material.

**MANUFACTURE:** Castings shall be of uniform quality, free from sand holes, gas holes, shrinkage, cracks and other surface defects. Castings shall be ground smooth and well cleaned by shot blasting. For traffic service castings, bearing surfaces between manhole rings and covers and frames shall be cast or machined with such precision to prevent rocking. As-cast dimensions may vary within accepted foundry tolerances as outlined in the Iron Castings Handbook published by the American Foundry Society, Inc. Nominally, casting dimensional tolerances shall be  $\pm 1/16$ " per foot. All published casting weights are average and approximate values and shall vary  $\pm 5\%$ . Castings shall be furnished painted or unpainted as specified by the purchaser.

**PROOF LOAD TESTING:** Traffic service castings shall have a first article proof load test conducted and the results of that proof load shall be made available

to the purchaser upon request. The proof load shall be conducted in accordance with the method and procedure that is outlined in AASHTO M306. The casting shall be tested on a suitable and calibrated load testing machine and the casting shall hold a 40,000 pound proof load for one minute without experiencing any cracks or detrimental permanent deformation.

**INSPECTION:** Inspections shall be in accordance with AASHTO M306. Results of these tests shall be furnished to the purchaser upon request. The heat or production date and product numbers, as cast on the casting shall be the basis of trace-ability and recording of the tests.

**CERTIFICATION:** A foundry certification shall be furnished to the purchaser stating that samples representing each lot have been tested, inspected, and are in accordance with this specification.

**MARKING:** Each casting shall be identifiable and show, at a minimum, the following: name of the producing foundry, country of manufacture (such as "Made in USA"), ASTM material designation, recycle symbol, individual part number, cast or heat date. Castings shall include all lettering as shown on the specification drawings.

**SAMPLING:** Random checks on the castings may be conducted by the purchaser. These random checks shall be conducted in accordance with AASHTO M306.

**RECORDS:** Test results for each lot of castings shall be maintained by the foundry for a minimum of seven years and shall be made available to the purchaser upon request.

